Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Unlicensed Operation in the TV Broadcast Bands	)	ET Docket No. 04-186
	)	
Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band	)	ET Docket No. 02-380
	)	
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COMMENTS OF TROPOS NETWORKS

Tropos Networks, headquartered in Sunnyvale, California, submits these Comments in response to the Commission's Notice of Proposed Rulemaking to allow unlicensed radio transmitters to operate in the broadcast television spectrum at locations where that spectrum is not being used.

Tropos believes that the Commission's proposal, when integrated into an overall comprehensive initiative promoting wireless broadband, can spur economic growth by making competitive advanced broadband services available to more people. Designating parts of this band, the so-called broadcast white space, for unlicensed use will contribute to this goal but not yield all the enormous potential wireless broadband presents. Whether the Commission's proposal in this proceeding will contribute to expanding broadband access depends upon whether technology and equipment in use across the unlicensed bands of the spectrum at the highest possible power levels can be employed without barriers in the broadcast white space.

Tropos Technology

Tropos technology delivers city-wide mobile broadband access via a scalable, reliable and secure Wi-Fi infrastructure in a licensed or unlicensed environment. As the leading supplier of equipment used to build metro-scale broadband networks, Tropos has recently established the industry's first strategy for integrating the open-standard WiMAX into new and existing metro-

scale Wi-Fi networks. The heart of the Tropos solution is a new class of product called a Wi-Fi cell, which layers patented routing intelligence on top of standard 802.11 to form an economical, self-configuring and self-healing wireless broadband data network that forwards client data through a mesh along the highest throughput path to a wired network. The result is a high performance, large scale Wi-Fi deployment with high throughput that does not require wired backhaul to each access point, installer truck rolls nor expensive and complex client devices and software. A Tropos system can be deployed at a multi-square-mile scale in a matter of days, providing an outdoor mobile broadband experience indistinguishable from indoor wireless and wired experiences.

Tropos patented technology maximizes throughput from client to server, eliminates the need for per node wiring and dynamically self-organizes as nodes are added or subtracted, backhaul supplied or removed, and interference comes and goes. The result is unprecedented bandwidth on the street, easy and low cost installation and operation, and true metro-scale coverage. Tropos products are providing a range of service providers and public safety agencies with the benefits of metro-scale Wi-Fi networks. Wireless broadband networks using Tropos technology are now operational in a myriad of environments ranging up to 60 square miles. Specific cities include Corpus Christi, Texas, Chaska, Minnesota, North Miami Beach, Florida, New Orleans, Louisiana, San Mateo, California and Cerritos, California.

The dense cell architecture underpinning these networks enables true broadband. Internet access as well as mission-critical broadband applications in mobile public safety environments, such as mobile database access, video surveillance, and GIS inquiries. Without any special client technology, Tropos products have been successfully deployed in cellular mesh networks to deliver up to 11 Mbps data rates with 99% coverage over multiple square miles.

Tropos' mesh network is premised on principles similar to those on which the Internet is based. The technology enables a self organizing system allowing nodes to be added or subtracted, a feature that remedies faults in backhaul or interference that are encountered. Any laptop or other device with Wi-Fi capability can connect to the network of antennas and stay connected even while the user carries or drives the laptop from place to place. The networks consist of Wi-Fi cells mounted on street lamps and telephone poles.

Tropos presents a state of the art security capability premised on decoupling security from the spectrum in which it products run. It leverages the inherent intelligence of its Wi-Fi cells and integrates the most vigorous Internet security techniques to offer a robust and multi layered security framework that can be efficiently and effectively upgraded. It confronts and deters the committed hacker who pursues disruption and invasion of either unlicensed or licensed networks.

Tropos products, encompassing dense cells and mesh, benefit any radio technology by bringing about enormous efficiencies in transmission and delivery. The result is a critical contribution to innovation and competition in the broadband environment and emanates from reducing dramatically backhaul costs and use of open standard radio. It presents a 20x better price performance than other mobile wireless broadband technologies. The result is a tangible and viable competitive choice in real broadband.

The Commission's Tentative Conclusion That the Broadcast White Space Will Enhance Wireless Services is Sound

Tropos' experience supports the Commission's tentative conclusion that it amend its rules to allow unlicensed devices to operate on unused frequencies in the broadcast bands. Providing more spectrum for unlicensed devices at adequate power levels will provide opportunities for the development of new unlicensed wireless communications devices and

systems, make more efficient use of the TV spectrum and expand broadband access. The favorable propagation characteristics of the TV spectrum can provide more effective service at greater ranges than unlicensed devices operating at higher frequency bands.

Access to the broadcast white space will benefit economic development for consumers and businesses by providing additional competition in the broadband market. Yet it is crucial that devices be permitted to operate at adequate power levels that comport with devices in other unlicensed spectrum, otherwise development in the band will lag substantially, with the danger that use will decline and the band becoming isolated. Moreover, access to the broadcast white space must be consistent with the historic use by unlicensed devices; there should be no barriers or gatekeepers regarding the use by any devices meeting the Commission's technical rules.

The Commission's Proposed Protection Criteria

The Commission suggests separate approaches as to how fixed and non-fixed unlicensed devices can afford broadcast operations protection. With regard to non fixed devices, the Commission states that the location of an unlicensed device could be determined by a professional installer or by using geo-location technology such as GPS incorporated within the device. While Tropos has no objection to the use of a professional installer, we offer one cautionary note in this regard. The requirements for professional installation must not be so onerous that few technicians can qualify. Otherwise, the potential for a near monopoly on installation services and, therefore, higher than necessary installation costs, will present a real danger to the market.

The other approach suggested requires non fixed devices to be capable of receiving information transmitted by a broadcaster that would indicate what channels are available. A more refined approach encompasses the device automatically adjusting and detecting the presence and

strength of RF transmissions from a broadcaster. This latter capability is within the parameters of Tropos technology. To provide further protection with regard to non-fixed unlicensed devices, a Dynamic Frequency Selection (DFS)-like, listen-before-talk mechanism can be integrated into the system. Additionally, Tropos fixed and non-fixed unlicensed devices are capable of transmitting an identification signal to facilitate determining the source of any interference. Overall, the capability enumerated by the Commission exists today at cost effective price points. Tropos embraces these protections and believes they will work effectively to protect broadcast users in the band.

Yet, in proposing that the unlicensed device be capable of receiving a control signal data from a broadcaster, the Commission also proposes that the control signal be a data stream from a digital TV station or other facility and that the transmission of this information would be on a voluntary basis and that parties could receive compensation for transmitting this information. Tropos does not object to a compensation structure that, assuming a control signal is necessary, the entity responsible for providing the signal be compensated for its costs. We do object if any compensation structure allows a broadcaster or other entity to thwart the ability of a device to use the broadcast white space. The broadcast interests, which oppose use of the white space would essentially control access to the spectrum. If a device must be capable of receiving control signal data in order to operate and the transmission of the signal is voluntary, a substantial barrier will be erected to the unlicensed use of the spectrum in that the broad flexibility associated with unlicensed spectrum is eliminated. The result would be contrary to the character of unlicensed use of the spectrum.

Additionally, while the Commission enumerates meritorious uses by broadcasters to employ the white space that would expand the industry's services and offer it a new source of revenue, no interest should be afforded exclusive use of the spectrum. The interests and

investment on the part of unlicensed technology will be substantially diluted if the environment is limited to or subject broadcast control.

There is a similar challenge with regard to the suggestion that the Commission should designate specific entities responsible for determining the unused channels in a station's service area such as a frequency coordinators, engineering consulting firms, or broadcast trade associations. Tropos reiterates that technology exists today that will ensure that unlicensed devices do not operate in a manner to cause interference to broadcasters. Imposing frequency coordination, engineering consulting firms or broadcast trade associations as a gatekeeper to use of the spectrum will detract substantially from the potential that this spectrum offers for expanding broadband access.

With regard to fixed/access types of devices, the Commission proposes use of a professional installer or that the fixed/access unlicensed transmitter have the capability to access a database and appropriate computational software to determine which TV channels are available for unlicensed use based on its location. The Commission proposes to require that such devices incorporate a method for determining geographic location with a minimum accuracy of 10 meters. The equipment must also have the capability to limit its transmissions to only those channels that are identified as unused through this process. The unlicensed device or its operator must be able to access periodically the channel availability database and software to ensure that the channels on which the device operates remain unused.

Tropos reiterates that technology exists to perform these responsibilities and that it would enhance the rollout of a variety of broadband services to look to technology to protect broadcaster interests. As noted, while Tropos has no real objection to requiring professional installers, once a regulatory process is established to control who may install and under what parameters, the potential for barriers to block entry become significant. Efforts should be directed toward

employing technology capable of accessing databases that can be updated and precludes a unit's operations if broadcaster presence is detected.

The Commission also requested comment on whether additional requirements where all fixed/access devices are registered with an industry-accepted entity, such as a frequency coordinator, that maintains a registration database of all fixed/access transmitters along with their operating frequencies be imposed. Tropos questions the gain to be had by such a database. The legitimate need to locate an interfering device is not promoted by a registration system requiring updates and changes. The greatest benefit to the broadcasters, the Commission and other interests is the technical capability to locate the offending device promptly. It is only then a remedy can be pursued. Technology, in contrast to a database, provides the most immediate recourse.

The Commission's Proposed Power Levels

Tropos has taken a consistent position in Commission proceedings that authorizing increased power levels for unlicensed wireless broadband will expand access and services to consumers, while protecting co and adjacent users. The Commission's proposes to allow fixed unlicensed devices to operate in the broadcast white space with a transmitter output power of up to one watt and to employ higher gain directional antennas, with requirements for transmitter output reductions for antennas with gains above 6 dBi. The promise of affording much greater broadband access is dependent on the multiple license-exempt bands being deployed within the same network to provide broadband service and we urge the Commission's embrace of this premise. Specifically, the power levels of a fixed devise and its client hardware operating in the broadcast white space must be adequate. To the degree there are inconsistencies among or within the bands so parallel services cannot be delivered, the promise of unlicensed spectrum in the broadcast white space to afford broadband services to more Americans at better prices will not be met.

SUMMARY

The Commission's proposal to allow unlicensed radio transmitters to operate in the broadcast television spectrum at locations where that spectrum is not being used is an important endeavor to bring broadband access to more Americans. Tropos urges the Commission to weigh carefully the need to ensure consistency across unlicensed spectrum so that the technology can deliver its full benefit.

Respectfully submitted,

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Certification

On November 30, 2004, an electronic copy of the foregoing Comments of Tropos Networks was filed with the Commission's Secretary in Dockets ET 04-186 and ET 02-380.

Signed

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